

Shallow Donors and Deep-Level Color Centers in Bulk AlN Crystals: EPR, ENDOR, ODMR and Optical Studies

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Abstract

The results of studies of shallow donors and deep-level color centers in bulk AlN crystals are presented. Two shallow donors (presumably oxygen located on the nitrogen site and carbon located on the aluminum site) are suggested to exhibit the DX-relaxation. Third shallow donor (presumably silicon on the Al site) shows the shallow donor behavior up to the room temperature and can be observed without light excitation at temperatures above 200 K. The values of the Bohr radius of the shallow donors are estimated. The structure of deep-level color centers (neutral nitrogen vacancy V N) in bulk AlN crystals is determined and analyzed by electron paramagnetic resonance, electron-nuclear double resonance, optical absorption and thermoluminescence induced by X-ray irradiation. Spin-dependent recombination processes in AlN crystals are studied by means of optically detected magnetic resonance. © 2013 Springer-Verlag Wien.

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